EE 692 – Computational Electromagnetics
Spring 2004

Instructors: Dr. Keith W. Whites (primary instructor)
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To contact the primary instructor, please use e-mail rather than the telephone. All e-mail will be answered. The primary instructor will be available for assistance during the hours listed above, as well as other times when the office door is open.

Catalog Description: (3-0) 3 credits. Prerequisites: Two courses in electromagnetics, or the equivalent, and knowledge of a mathematics package; or permission of instructor. The course will provide a practical overview of computational electromagnetics, emphasizing the method of moments and the finite difference time domain method.

Time and Location: Tuesday and Thursday from 3:00-4:15 PM in room 253 EP.

Course Reference Materials:
1. K. W. Whites, "Lecture Notes: EE 692 Computational Electromagnetics," 2004. Required. (Will be available from the bookstore.)
2. A. F. Peterson, S. L. Ray and R. Mittra, *Computational Methods for Electromagnetics*. New York: IEEE Press, 1998. Recommended.
3. R. F. Harrington, *Field Computation by Moment Methods*. Malabar, FL: Robert E. Krieger, 1982. Recommended.
4. K. S. Lunz and R. J. Luebbers, *The Finite Difference Time Domain Method for Electromagnetics*. Boca Raton, FL: CRC Press, 1993. Recommended.
5. A. Taflove, *Computational Electrodynamics*: *The Finite-Difference Time-Domain Method*. Boston, MA: Artech House, 1995. Recommended.

Grading: 20 % – Homework
60 % – Computer projects
20 % – Final exam

All computer projects and the final exam must be completed in order to receive a passing grade. No more than 50% credit will be given for a non-functioning program.

Computer Projects: Approximately six computer projects will assigned during the semester. These assignments must be completed using a mathematics package such as *Mathematica*, *Matlab* or *Mathcad*.

Homework Policy: Homework assignments and computer projects are to be turned in at the beginning of the class period on the due date. Late homework will be assessed a 10% point reduction per calendar day.

Exam Policy: The final exam will be closed book and closed notes with no formula sheets. Using or referring to equations stored in a calculator is not allowed, even if these equations come pre-programmed into the calculator.

Honor System: All homework, computer projects and the final exam must be your own work. Failure to abide by this rule will result, at a minimum, in a zero score for the assignment and/or further action following SDSMT regulations. Homework solutions and computer projects can be discussed with your colleagues but the work you submit must be your own.

EE 692 Class Schedule
Spring 2004

Date	Topic
1/8	Course overview. Review of Maxwell's equations and boundary conditions.
1/13	Source/field relationships. Infinite current sheet example. Green's functions.
1/15	Quasi-static problems and integral equations. Linear spaces.
1/20	Method of moments (MM). Basis and testing functions.
1/22	MM solution examples: static plate and microstrip.
1/27	Implementation of MM. Examples and results. Solutions to systems of linear equations.
1/29	Electric field integral equation for PEC bodies. Pocklington's integral equation.
2/3	Green's function singularity. Smooth thin-wire kernel.
2/5	Near electric fields produced by current subdomain functions.
2/10	Thin wire scattering: MM implementation using the Glisson/Wilton method.
2/12	Excitation of thin wire problems. Near and far field calculations, RCS.
2/17	Numerical integration methods.
2/19	Solution of wave equation in 2-D. Properties of Bessel, Neuman and Hankel functions.
2/24	Examples of solutions for cylindrical structures. Green's function for 2-D sources.
2/26	Formulation of TE and TM scattering by strips.
3/2	MM implementation of strip scattering. Singularity extraction.
3/4	Scattered field and RCS calculation for strips. Physical optics approximation.
3/9	**Spring vacation.**
3/11	**Spring vacation.**
3/16	Periodic structures and Floquet's theorem.
3/18	1-D periodic Green's function.
3/23	EFIE for TM grating scattering. Periodic Green's function acceleration.
3/25	Magnetic sources, duality, boundary conditions, wave equations.
3/30	Surface equivalence theorem. Stratton-Chu formulation.
4/1	EFIE and MFIE for PEC cylinders. EFIE for TM and TE scattering.
4/6	TM scattering by PEC cylinders: EFIE MM and analytical solutions.
4/8	TE scattering by PEC cylinders: EFIE MM and analytical solutions.
4/13	FDTD (Dr. Montoya)
4/15	FDTD (Dr. Montoya)
4/20	FDTD (Dr. Montoya)
4/22	FDTD (Dr. Montoya)
4/27	FDTD (Dr. Montoya)
4/29	FDTD (Dr. Montoya)
5/7	**Final Exam**, 7:00-8:50 AM, Room 253 EP